

### 632.1 DESCRIPTION

This work consists of furnishing materials, making and preparing signs and delineators, and performing incidental work, including erection, installation, hardware, posts, breakaway bases, concrete footings, and structures.

### 632.2 MATERIALS

Materials shall conform to Section 982.

Reinforcing steel shall conform to Section 1010.

Concrete shall conform to Class M6 (I28) as specified in Section 462.

Bolts shall conform to Section 972.

### 632.3 CONSTRUCTION REQUIREMENTS

Highway signs and delineators shall comply with the MUTCD and Standard Highway Signs, issued by the U.S. Department of Transportation, FHWA.

Concrete for sign post footings shall be proportioned, mixed, hauled, and placed in accordance with Section 460.

#### A. Signs:

1. **Location and Position:** The location of each sign shall be established by a stake bearing the sign number as determined from the plans.

Posts shall be in a plumb position and the flanges of structural shape posts or other supports shall lie in the same plane.

Extruded panels shall be flat and straight and shall be erected on the posts in a truly horizontal position with the face of each extrusion flush with adjoining extrusions. Bolted connections between adjoining panels shall be straight. Offsets or gaps exceeding 1/16 inch (2 mm) will not be permitted.

2. **Post Size:** Post size will be specified in the contract for each type of sign. Sign post lengths shown in the contract are estimates for bidding purposes only. The exact post lengths will be determined by the Engineer prior to construction.

**B. Mileposts:** Mileposts shall be of the type specified and erected at the location shown, as directed by the Engineer.

**C. Object Markers:** Object markers of the type specified shall be erected as directed by the Engineer.

**D. Delineators:** Delineators shall be mounted as shown.

**E. Perforated Tube Posts and Flanged Channel Posts:** Perforated tube posts and flanged channel posts shall be installed in accordance with the contract or as directed by the Engineer.

**F. Steel Posts:** Steel posts which are not of the lengths determined by the Engineer shall be cut off or spliced in a satisfactory manner. Areas where the galvanizing has been damaged shall be coated with an approved zinc rich paint.

Modification of the post flanges, web, or cross section will not be permitted without the approval of the Engineer when supports are reused.

**G. Wood Posts:** Wood posts shall be embedded a minimum of 4 feet (1.2 m). Wood posts which are longer than the lengths determined by the Engineer, shall be cut off or set deeper. Compensation shall be limited to the length determined by the Engineer. Holes for setting wood posts shall be a minimum diameter of six inches (150 mm) larger than the greatest side dimension of the post. The posts shall be set and backfilled and compacted with material placed in layers not to exceed six inches (150 mm).

**H. Sign Bridges and Overhead Cantilever Sign Supports:** Sign bridges and overhead cantilever sign supports shall be constructed in accordance with the details and at the locations shown.

#### **1. Design Specifications:**

**a.** The current edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, including all subsequent Interims.

**1)** Wind pressure shall be calculated as per Equation 3-1 based on a basic wind speed of 90 mph.

**2)** The cantilever supports, including anchor bolts, shall be designed for fatigue in accordance with Fatigue Importance Category I. This is to include Truck-Induced Gust loads, Natural Wind Gust loads, and unless installed with approved vibration mitigation devices, shall also include Galloping loads.

**a)** Details for any proposed vibration mitigation devices must be submitted with the shop plans on these structures for approval by SDDOT prior to fabrication. Supporting documentation (historical and research data) verifying the damping characteristics of the specific mitigation device for the intended structural support application must accompany the submittal.

#### **2. General:**

**a.** Cantilever arms shall be truss type members. Mono-tube or single member arms are not allowed.

**b.** No splices of any kind will be permitted in the vertical pole members.

- c. Anchor bolts shall be in accordance with Section 985.1.E.
- d. All members and components shall be galvanized after fabrication in accordance with ASTM A123 or A153 as applicable.

### 3. Shop Plans:

The fabricator shall initially submit three (3) copies of the Shop Plans to the Office of Bridge Design for review. Comprehensive design calculations for the sign support structure (including anchor bolts), signed and sealed by a SD Registered Engineer, shall be submitted with the shop plans. One reviewed copy of the shop plans will be sent to the fabricator who will then make the necessary changes, if any, and then send the Office of Bridge Design six (6) final approved copies for distribution.

### 4. Fabrication:

- a. Welding and weld inspection shall be done in accordance with the latest edition of ANSI/AWS D1.1 Structural Welding Code.
- b. Approved Welding Procedure Specifications (WPS) are required for all welding. WPS's shall be based upon Procedure Qualification Testing (PQT) in accordance the latest edition of ANSI/AWS D1.1 Structural Welding Code.
- c. If welded connections are used subsequent to galvanizing, the weld details and the procedure for preparing the surface for welding and repainting the galvanizing after welding shall be included with the Shop Plans.
- d. The SDDOT Bridge Construction Engineer shall be notified as to what date fabrication will begin. This notification shall be provided a minimum of thirty days prior to fabrication. The Bridge Construction Engineer will at that time arrange for fabrication inspection. Fabrication shall not begin until authorization has been given by the Bridge Construction Engineer.

**I. Bridge Mounted Sign Support Assemblies:** Bridge mounted sign support assemblies shall be constructed in accordance with the details and at the location shown.

**J. Fixed Base Assemblies:** Fixed base assemblies shall be assembled in accordance with details shown. High strength bolted connections shall be tightened as specified using load indicator washers.

**K. Slip Base Assemblies:** Slip base assemblies shall be assembled in accordance with the details shown.

The top of the concrete footing/grout pad shall be placed flush with the finished grade. The mounding of soil around the footing will not be permitted.

**L. Reflective Sheeting:** Reflective sheeting shall be of the type specified.

**M. Concrete Footings:**

1. **Construction:** Concrete footings shall be constructed as shown. When the sign post footings extends into ledge rock, the portions of the plan specified depths which are in solid rock should be reduced by one half. Reduction from the plans shown quantities of concrete for footings will be made for any changes in footings depths. Posts shall be anchored to footings as shown on the plans. Dirt excavated for the footings shall be disposed of as directed.
2. **Protection and Cure:** Concrete footings shall be protected and cured in accordance with Section 460, except the minimum curing time shall be 72 hours. The finished surface of the concrete footings shall be flush with the existing ground and shall present a neat and smooth appearance.

**632.4 METHOD OF MEASUREMENT**

- A. **Signs:** Signs will be measured to the nearest 0.1 foot (25 mm) and the area computed to the nearest 0.1 square foot (0.01 square meters) of the sign face. Deduction will not be made for rounded corners.
- B. **Mileposts:** Milepost quantities will be determined by count of each type.
- C. **Object Markers:** Object markers quantities will be determined by count of each type.
- D. **Delineators:** Delineator quantities will be determined by count of each type.
- E. **Perforated Tube Posts and Flange Channel Posts:** Post quantities for steel posts, other than those used for mileposts and object markers, will be measured to the nearest 0.1 foot (25 mm).
- F. **Steel Post (Structural and Pipe):** Post quantities will be measured to the nearest 0.1 foot (25 mm) for the various sizes and types.
- G. **Wood Posts:** Post quantities will be measured to the nearest 0.1 foot (25 mm) for the various sizes.
- H. **Sign Bridges and Overhead Cantilever Supports:** Sign bridges and overhead cantilever supports will be measured on a per each basis.
- I. **Bridge Mounted Sign Support Assemblies:** Field measurement of this item will not be made.
- J. **Fixed Base Assemblies:** Field measurement will not be made.
- K. **Slip Base Assemblies:** Field measurement will not be made.
- L. **Reflective Sheeting:** Field measurements will not be made.
- M. **Concrete Footings:** Concrete footings of the various types and diameters will be the depth of concrete to the nearest 0.1 foot (25 mm).

**632.5 BASIS OF PAYMENT**

- A. Signs:** Sheet aluminum and extruded aluminum signs will be paid for at the contract unit price per square foot (0.1 square meter). Payment will be full compensation for furnishing and installing materials, including borders, legend, and edge trim.
- B. Mileposts:** Mileposts will be paid for at the contract unit price per each. Payment will be full compensation for furnishing and installing materials, including post, post anchor, sign, and hardware.
- C. Object Markers:** Object markers will be paid for at the contract unit price per each. Payment will be full compensation for furnishing and installing materials, including posts, reflective panels, and hardware.
- D. Delineators:** Delineators will be paid for at the contract unit price per each. Payment will be full compensation for furnishing and installing materials, including posts, reflectors, and hardware.
- E. Perforated Tube Posts and Flange Channel Posts:** Perforated tube posts will be paid for at the contract unit price per foot (0.1 m). Payment will be full compensation for furnishing and installing materials, including post anchors, anchor sleeves, mounting hardware, telescoped inner post sections, and anchor plates.
- F. Steel Posts (Structural and Pipe):** Steel posts, of the various sizes and types will be paid for at the contract unit price per foot (0.1 meter). Payment will be full compensation for furnishing and installing materials, including sign posts connections, splices, cutoffs, base assemblies, frame assemblies, and stiffeners.
- G. Wood Posts:** Wood Posts, of the various sizes and types will be paid for at the contract unit price per foot (0.1 meter). Payment will be full compensation for furnishing and installing materials, including sign post connections, frame assemblies, and stiffeners.
- H. Sign Bridges and Overhead Cantilever Supports:** Sign bridges and overhead cantilever supports will be paid for at the contract unit price per each. Payment will be full compensation for furnishing labor, equipment, and materials. Extruded aluminum signs will be paid for separately at the contract unit price per square foot (0.1 square meter).
- I. Bridge Mounted Sign Support Assemblies:** This work will be paid for at the contract lump sum price. Payment will be full compensation for labor, equipment, and materials. Extruded aluminum signs will be paid for separately at the contract unit price per square foot (0.1 square meter).
- J. Fixed Base Assemblies:** Separate payment will not be made for fixed base assemblies. The fixed base assemblies will be considered incidental to the sign post furnished.
- K. Slip Base Assemblies:** Separate payment will not be made for slip base assemblies. The slip base assemblies will be considered incidental to the sign post furnished.

**L. Reflective Sheeting:** Separate payment will not be made for reflective sheeting. The reflective sheeting will be considered incidental to the sign furnished.

**M. Concrete Footings:** Concrete footings of the various types and diameters will be paid for at the contract unit price per foot (0.1 meter). Payment shall be full compensation for excavation and backfilling and for furnishing and installing materials, including stub posts, bolts, castings, reinforcing steel, and other hardware.